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**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking into Policies to Promote a Partnership Framework between Energy Investor Owned Utilities and the Water Sector to Promote Water-Energy Nexus Programs.	Rulemaking 13-12-011 (Filed December 19, 2013)

COMMENTS OF THE UTILITY CONSUMERS' ACTION NETWORK (UCAN) ON THE ASSIGNED COMMISSIONER'S RULING REQUESTING COMMENTS TO SUPPORT INTEGRATION OF THE EMBEDDED COST OF NATURAL GAS INTO THE WATER-ENERGY COST CALCULATOR

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I. INTRODUCTION

The Utility Consumers Action Network (UCAN) hereby offers these comments to Commissioner Sandoval's Assigned Commissioner's Ruling requesting comments to support the integration of the embedded cost of natural gas into the water-energy cost calculator. The ACR requests parties to comment on the ways to modify the current Water-Energy Nexus (WEN) Cost Effectiveness (CE) Calculator to incorporate natural gas, the direct and indirect uses of natural gas in the water system, and procedural methods for getting the job done, e.g. establishing working groups or some other approach to work on integrating natural gas costs into the WEN CE Calculator.

Integrating natural gas costs should be a less complicated process than the original Navigant effort as much of the preliminary work was already been done through the development of the original Navigant cost calculator. Avoided water capacity and O&M costs as well as the embedded electricity costs in water use have been developed along with how these terms fit within the Cost Effectiveness Tests originally developed to evaluate demand-side programs as alternatives to electricity and natural gas usage. The integration of natural gas costs requires only that we (1) adapt the natural gas equations from the current Calculator and identify where natural gas is consumed in the water system, subsequently calculating the embedded natural gas costs in water use.

The ACR requests that parties respond to specific questions. These are addressed following the general discussion below.

II. DISCUSSION

Navigant recently produced a Calculator Model for use when evaluating joint Water-Energy Nexus (WEN) projects. The previous project with Navigant developed avoided water capacity and O&M costs as well as embedded electricity costs in water use. These cost elements were added to the traditional California Cost Effectiveness (CE) Model and CE Tests. The modified California CE Model included the water-related avoided capacity and avoided O&M costs in the Total Resource Cost (TRC) equation. Additionally, the embedded electricity in water was added to the TRC equation.

A second aspect of the Navigant Model determined how to allocate program costs among the water and energy sector participants to determine the co-funding shares for each participant. The program costs were allocated based on the "benefits received principle". That is, both the energy sector and water sector receive benefits from a joint WEN project in terms of avoided costs. Funding of the WEN program then is apportioned according to the benefits or avoided costs attributed to each sector and/or participant.

The current ACR calls for adding avoided natural gas capacity and O&M costs as well as embedded natural gas in water use. This is a reasonable next step so that the Navigant WEN CE Calculator Model can address the impact of water savings on both electricity and gas energy efficiency measures. Since the water-related avoided costs were already developed by Navigant, the "embedded natural gas in water use" needs to be developed to enable the CE model to address both water-electricity and water-gas projects. The utilities already have avoided gas capacity and O&M costs as part of the current CE Calculator for evaluating demand-side programs and projects. But the water-gas relationships are not available through the energy utilities. Therefore, what remains to be done is to develop the embedded natural gas in water relationships for the current Navigant model which is based on the original **Standard Practices Manual** (SPM) equations used by the Commission and adapt any other SPM equations to address the avoided natural gas capacity and O&M costs from the SPM if they are not included in Navigant's adaptation of the current CE test equations to the WEN CE Model.

But there are additional concerns that should be addressed related to the embedded electricity and natural gas in water that the Commission should ensure can be addressed in the Navigant Calculator. Clearly, there is a water-energy connection in generation because of the fact that generating plants require water for cooling and there may be a time-of-use aspect to the water-energy relationship as well.

An EPRI report documents for California the substantial range of water requirements for closed loop and once through cooling. See below:

TABLE
Approximate Withdrawal and Consumption
(rounded and not accounting for ambient temperature or plant efficiency) [1]

Plant and Cooling System Type	Withdrawal (liters/MWh)	Consumption (liters/MWh)
Fossil fuel/biomass/waste with once through cooling system	76,000-190,000	1,000
Fossil fuel/biomass/waste with Closed loop cooling system	2,000-2,300	2,000
Nuclear steam with once through cooling system	95,000-230,000	1,500
Nuclear steam with closed cooling system	3,000-4,000	3,000

There are two means of reducing water usage: (1) water cooling requirements for the cooling process for power plants, e.g., once through cooling or closed loop cooling and (2) water cooling requirements for renewable generation which is abundant in the midday hours. The embedded electricity and gas in water consume based on both time-of-day and water cooling process requirements which vary be type of generation. That is, reducing water use in a joint WEN project reduces electricity generation which also reduces water consumption required for cooling. Water use for generation can also vary by time-of-day based upon the hours when

[1] Comparison of Alternate Cooling Technologies for California Power Plants Economic, Environmental and Other Tradeoffs, Electric Power Research Institute (EPRI), 2002.

renewable energy is abundant and require less cooling water. Thus, the water requirements for cooling depend on the type of generation, the type of cooling and the time-of-day. Specifically, renewable generation requires less water than fossil fuel generation. Closed loop cooling requires substantially less water than once through cooling. Finally, during midday hours when renewable energy is abundant, less cooling water is required. Therefore, the modifications to the Calculator Model should not only add the embedded natural gas in water use but also the time-of-day component (which will apply to both electricity and natural gas saving measures). Finally, since cooling water is saved when less electricity is generated, and much electricity generation is gas-fired, a relationship can also be posited between water and gas-fired generation specifically.

UCAN's main point in this discussion is that water-energy relationships should not be limited to the end uses, e.g., low flow shower heads and gas water heaters, but up and down the supply chain as Navigant addresses in its reports. This generation cooling example is one that UCAN wants to make sure the Navigant model can address when evaluating programs and related projects.

III. ISSUES ON USE OF COST EFFECTIVENESS TESTS

The current CE tests in the original form and the Navigant modification calculate the stream of benefits and costs based on levelized costs instead of the preferred real economic carrying charge (RECC). The levelized costs is analogous to a mortgage payment and is not appropriate because it overstates the benefits and costs in the early years and understates them in the later years. Levelized costs include inflation. Technically, the RECC is a levelized cost calculation with inflation removed and then added to the levelized amount in each year, creating an increasing amount instead of a constant amount.

Therefore, if the energy efficiency measure suffers from the persistence problem, where customers can drop out of a program before the full life-cycle benefits are realized, a levelized payment will overstate the value of the program in the early years and understate the value in the later years. UCAN continues to believe that the RECC, on the other hand, is more appropriate because it offers the correct increasing value in each year. Should the benefit-cost results be used to guide the level of incentives offered, levelized results may overstate or understate the appropriate level of incentives, depending on the year of the program. The RECC does not suffer from the same problem.

IV. ACR QUESTIONS

1) Please propose overall strategies to enhance or augment the water energy calculator to recognize embedded use of natural gas;

Since the WEN CE Calculator already includes the avoided water capacity and O&M costs, the primary requirements for the current ACR augmentation to the CE Model are (1) the marginal natural gas capacity and O&M costs, i.e., counterparts to the avoided electric capacity and O&M costs, and (2) the embedded gas cost in water use.

2) Please detail both the embedded and direct use of natural gas in any and all places in the California water system not currently captured by the Water-Energy Cost Calculator;

The previous work by Navigant developed a Water-Energy Nexus (WEN) Cost Calculator that adds avoided water capacity and O&M costs as well as the embedded electricity in water use. Irrigation provides an excellent example of an end use where significant water is used for crop irrigation and there are embedded electricity costs where electric pumps are used to irrigate.

There is also a relationship between electric generation and water use since electric generation requires water for cooling. The two methods are (1) once through cooling and (2) closed loop cooling. As we have shown, closed loop cooling uses significantly less water for cooling. In addition, renewable generation resources also have lower cooling requirements (less water).

As we move up the supply chain, we note that some electricity is gas-fired and so there is also an indirect relationship between water use and natural gas consumption. Thus, irrigation is a direct use of water in agricultural and pumping has impacts on electricity and natural gas. Adopting higher efficiency irrigation methods will impact water use directly and indirectly. Directly, the higher efficiency methods use less water although conversion can be expensive. Indirectly, the higher efficiency irrigation methods (or any reduction in water use for irrigation, e.g., different crops have different water requirements) reduce generation which reduces water cooling requirements. However, conversion to these modern irrigation methods can be expensive and not cost effective. In considering the conversion to modern irrigation methods, it is important to determine the increased efficiency yielded by the conversion as well as the cost of the new equipment.

Shifting consumption from on-peak hours to midday hours to take advantage of renewable generation can reduce water use in terms of generation cooling requirement. Reduced cooling requirements also depends on the cooling process itself, e.g., once through cooling versus closed loop cooling.

Residential water heating by natural gas is the simplest example of embedded gas use. Since water can be heated by electricity or natural gas, both need to be addressed. Finally, low flow shower heads are an energy efficiency measure that can reduce water and either natural gas or electricity use.

Regarding the CE calculators developed by E3 and by Navigant, the E3 Calculator addresses both electric and natural gas savings (avoided costs and benefits) but ignores water savings (avoided capacity and O&M as well as embedded electricity in water). On the other hand, the Navigant Calculator addresses avoided electric costs and benefits as well as avoided water capacity and O&M as well as embedded electricity in water. But the Navigant model focused on avoided electricity costs and not the embedded natural gas in water. The avoided natural gas costs can be adapted from the E3Model but embedded natural gas in water needs to be developed.

3) For the utilities, please identify the appropriate contact person in the area of conservation and partnership programs for further communication and programmatic updates. We anticipate that there will be additional workshops on both the calculator in particular and in the water/energy nexus proceeding in general; and

No comment. Utilities only.

4) **Should we form a Natural Gas/Water/Energy Nexus Working Group? If so, what should its charge be regarding Cost Calculator 2.0 proposals, the Aliso Canyon State of Emergency, or other Natural Gas/Water/Energy Nexus issues?**

A small technical working group, including water and gas experts as well as Navigant, is most appropriate for resolving the technical aspects of the project. The expertise required for the small working group includes the logic and equations in the California Cost Effectiveness Tests, expertise in water use where there are embedded gas consumption and potential savings. A larger working group may be advisable for periodic updates and feedback.

Natural gas utilities should have marginal natural gas capacity and O&M costs which are used in rate design and evaluating cost effectiveness of natural gas conservation programs. But the CE model does not include the direct and indirect water savings that would make the original CE calculator appropriate for WEN projects.

However, as stated above, this may also be an opportunity to address the missing element in the current Calculator. That is, the embedded water in electric generation, including natural gas-fired and renewable generation, specifically where water is used for generation cooling requirements. This has a time-of-use component which the Navigant model does not currently address.

V. CONCLUSION

UCAN appreciates the opportunity to respond to this ACR.

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Respectfully submitted,

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